

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 1, 2019/2020

### PTM 0145 –TRIGONOMETRY

(Foundation in Information Technology / Foundation in Life Sciences)

15 OCTOBER 2019  
9.00 a.m. – 11.00 a.m.  
(2 Hours)

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#### INSTRUCTIONS TO STUDENT

1. This question paper consists of **TWO** printed pages, excluding the front page and the appendix. Distribution of marks for each question is given.
2. Answer **ALL** questions.
3. Write your answers in the Answer Booklet.
4. All necessary workings **MUST** be shown.

**Instructions:** Answer **ALL FIVE** questions.

**Question 1 [10 marks]**

- a. Given  $z = -4 + 3i$  and  $w = 5 - 4i$ .
- Find the polar form of  $z$  and  $w$ . (4 marks)
  - Find the polar form of  $\frac{w}{z}$  and  $\left(\frac{w}{z}\right)^4$ . (3 marks)
- b. Solve the equation  $x^2 + 4x + 5 = 0$  in the complex number system. Write the answer in the standard form  $a + bi$ . (3 marks)

**Question 2 [10 marks]**

- a. Given the vertex of the parabola is (3, 6) and the directrix line is 2 units above the vertex.
- Sketch the graph of the parabola based on the above information and hence identify the axis of symmetry and the focus point. (3 marks)
  - Find the equation of the parabola and write the answer in  $y = ax^2 + bx + c$ . (2 marks)
- b. Sketch the graph and identify the coordinates of the center, vertices and foci of the given function  $\frac{(x-4)^2}{36} + \frac{(y+6)^2}{20} = 1$  (5 marks)

**Question 3 [10 marks]**

- a. Given  $A = \begin{bmatrix} 2 & 10 & -8 \\ -3 & 1 & -2 \\ 0 & 4 & 3 \end{bmatrix}$ ,  $B = \begin{bmatrix} 7 & 2 & -3 \\ -4 & 2 & 9 \end{bmatrix}$  and  $C = \begin{bmatrix} 3 & -1 & 5 \\ -2 & 6 & 1 \end{bmatrix}$ .
- Find the matrices  $(B + 3C)^T$  and  $A^2$ . (4 marks)
- b. Solve the following system of linear equations by using the inverse matrix method.
- $$\begin{aligned} 3x + 4y &= -13 \\ x + 2y - 5z &= 1 \\ 2x + 5z &= -21 \end{aligned}$$
- (6 marks)

**Continued...**

**Question 4 [10 marks]**

- a. Solve the equations, for  $0^\circ \leq x \leq 360^\circ$ .
- i.  $2\cos^2 x - \cos x - 1 = 0$ . (3 marks)
- ii.  $\sin 2x + \frac{1}{\csc x} = 0$ . (3 marks)
- b. Find the exact value of  $\cot\left(\cos^{-1}\left(-\frac{1}{4}\right)\right)$ . Do not use a calculator. (2 marks)
- c. Prove the identity:  $2\cot x = \sin 2x \csc^2 x$ . (2 marks)

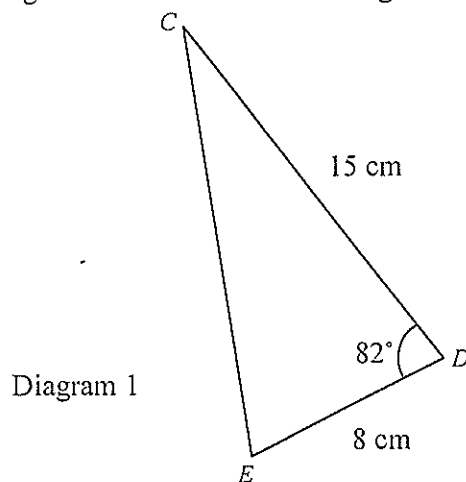
**Question 5 [10 marks]**

- a. Determine the amplitude, period and phase shift of the function:

$$y = \frac{3}{2} \sin\left(2x - \frac{\pi}{4}\right)$$

Then, draw the graph for the function above in 2 periods. Identify the minimum, maximum point and at least 2 x-intercepts. (6 marks)

- b. Diagram 1 shows a triangle  $CDE$ .
- i. Calculate the length of  $CE$ . (2 marks)
- ii. Find the angle  $E$  and the area of the triangle. (2 marks)

**End of Paper**

## APPENDIX

### Trigonometry Identities

$$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$$

$\cos(A+B) = \cos A \cos B - \sin A \sin B$		$\cos 2A = \cos^2 A - \sin^2 A$
$\cos(A-B) = \cos A \cos B + \sin A \sin B$		$= 2\cos^2 A - 1 = 1 - 2\sin^2 A$
$\sin(A+B) = \sin A \cos B + \cos A \sin B$		$\sin 2A = 2\sin A \cos A$
$\sin(A-B) = \sin A \cos B - \cos A \sin B$		
$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$		$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$
$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$		

$$\sin A \cos B = \frac{1}{2} [\sin(A+B) + \sin(A-B)]$$

$$\cos A \cos B = \frac{1}{2} [\cos(A+B) + \cos(A-B)]$$

$$\sin A \sin B = \frac{1}{2} [\cos(A-B) - \cos(A+B)]$$

$$\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2}$$

$$\sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}$$

$$\cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\sin^2 \frac{A}{2} = \frac{1 - \cos A}{2}$$

$$\cos^2 \frac{A}{2} = \frac{1 + \cos A}{2}$$

$$\tan^2 \frac{A}{2} = \frac{1 - \cos A}{1 + \cos A}$$

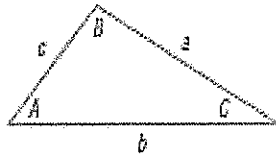
$$\sin \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{2}}$$

$$\cos \frac{A}{2} = \pm \sqrt{\frac{1 + \cos A}{2}}$$

$$\tan \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}}$$

$$\tan \frac{A}{2} = \frac{1 - \cos A}{\sin A} = \frac{\sin A}{1 + \cos A}$$

## Triangles



**Law of Sines:**

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

**Law of Cosines:**

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

**Area of a Triangle:**  $A = \frac{1}{2} ab \sin C = \frac{1}{2} bc \sin A = \frac{1}{2} ac \sin B$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \quad \text{where } s = \frac{1}{2}(a+b+c)$$

## Polar Coordinates

$$x = r \cos \theta$$

$$y = r \sin \theta$$

$$r = \sqrt{x^2 + y^2}$$

$$\tan \theta = \frac{y}{x}$$